PATENT ABSTRACTS OF JAPAN

(11)Publication number : 10-163802
(43)Date of publication of application : 19.06.1998

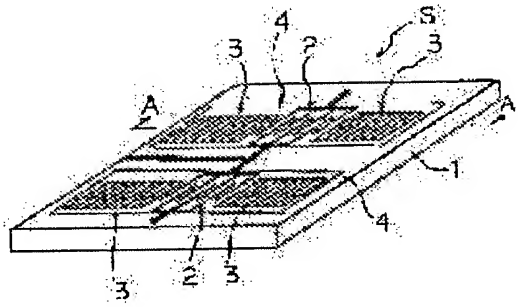
(51)Int.Cl. H03H 9/25
H03H 9/145

(21)Application number : 08-320521
(22)Date of filing : 29.11.1996

(71)Applicant : KYOCERA CORP
(72)Inventor : MATSUDA TOSHIYA
KAGAI EMI
FUNEMI MASAYUKI
IKEGAMI YOSHIHIDE

(54) SURFACE ACOUSTIC WAVE DEVICE

(57)Abstract:
PROBLEM TO BE SOLVED: To provide a surface acoustic wave device which is free from deterioration in its characteristic and has high reliability by providing an exciting electrode, etc., on a piezoelectric substrate to generate a surface acoustic wave and laminating a protective film having a surface acoustic wave speed higher than the piezoelectric substrate and having a specific relative resistance value/ film thickness on the exciting electrode.
SOLUTION: A metallic exciting electrode 2 and a reflector electrode 3 are provided on a piezoelectric substrate 1, and a protective film 4 is formed at the areas of both electrodes 2 and 3. The substrate 1 uses a lithium tantalate material and the film 4 uses a such material as silicon, having a higher surface acoustic wave speed than the substrate 1. Thus, the electrode pitch is decided with a larger degree of freedom and production of the electrode 2 is facilitated. Furthermore, the ratio between the relative resistance value and the thickness is set at 109 to 1013Ω for the material of the film 4. Thereby, the extra electric charge flows through the film 4 to relax the unevenness of a charge density distribution that is caused among electrode fingers of the electrode 2, etc., by the pyroelectricity of the substrate 1.



LEGAL STATUS

[Date of request for examination]

[Date of sending the examiner's decision of rejection]

[Kind of final disposal of application other than the examiner's decision of rejection or application converted registration]

[Date of final disposal for application]

[Patent number]

[Date of registration]

[Number of appeal against examiner's decision of rejection]

[Date of requesting appeal against examiner's decision of rejection]

[Date of extinction of right]

* NOTICES *

1.This document has been translated by computer. So the translation may not reflect the original precisely.
2.**** shows the word which can not be translated.
3.In the drawings, any words are not translated.

CLAIMS

[Claim(s)]
[Claim 1] Surface acoustic wave equipment on which the protective layer which consists of the ingredient whose ratios (resistivity/thickness) of resistivity and thickness are 109-1013ohm on this excitation electrode while forming the excitation electrode made to generate a surface acoustic wave on a piezo-electric substrate was made to put.
[Claim 2] Said protective layer is surface acoustic wave equipment according to claim 1 characterized by consisting of an ingredient with the rate of a surface acoustic wave quicker than said piezo-electric substrate.

[Translation done.]

DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[Field of the Invention] This invention relates to surface acoustic wave equipments, such as a surface acoustic wave (SAW) filter which prepares an excitation electrode in the piezo-electric substrate which consists of single crystals, such as lithium tantalate, lithium niobate, and a tetraboric acid lithium, and grows into it.
[0002]
[Description of the Prior Art] Conventionally, promising ** of the single crystals, such as lithium tantalate (LiTaO3), is carried out as an ingredient which it is observed very much as an ingredient with the large electromechanical coupling coefficient generally used as a performance evaluation of piezoelectric material, for example, is used for various piezo-electric devices, such as surface acoustic wave equipments, such as a surface acoustic wave filter and a surface acoustic wave resonator, and a bulk wave device.
[0003] When aluminum is especially used as an IDT electrode material, using the lithium tantalate single crystal of 36 degreeY cut X propagation as a substrate, it is made optimal to make or less into 0.1 standardization thickness H/lambda of an IDT electrode to the wavelength of the surface acoustic wave made to spread (see JP,6-188673,A etc.).
[0004] However, in order to constitute the front end SAW filter (analog: 900MHz a band and digital:15GHz band) used, for example for telephones for mobile communications, such as a cellular phone and PHS (Personal Handy-phone System) For example, if it is an AMPS (Advanced Mobile Phone Service) method, in spite of needing the big magnitude of attenuation 20dB or more out of band also at the lowest Even if it was going to apply the lithium tantalate single crystal which was excellent in property to the substrate ingredient, it had the above magnitude of attenuation out of band, and, moreover, there was nothing that has a small insertion loss. Moreover, dispersion in the property of a finished product was large, and many things of a poor property had occurred.
[0005] It is possible to be shown below as one of such the causes. For example, although it is common that the protective coat which metal electrodes, such as an excitation electrode which constitutes the shape of a ctenidium, are prepared on the above piezo-electric substrates, and consists of an insulating ingredient on metal electrodes, such as this excitation electrode, is covered and constituted as for a surface acoustic wave filter When the piezo-electric substrate was put on the bottom of a hot environment at the process after electrode formation of an excitation electrode etc., uneven charge distribution arose on the piezo-electric substrate front face, and the electrode carried out deformation etc. by the discharge which this became a cause and was generated, as a result degradation of a filter shape etc. was induced.
[0006] That is, in processes at the time of package mounting after electrode formation of an excitation electrode etc., such as die bonding and wire bonding, if a piezo-electric substrate is put on the bottom of elevated temperature about 80 degrees C or more, charge distribution will arise on a piezo-electric substrate front face by the pyroelectricity of a piezo-electric substrate. And although the charge produced on this piezo-electric substrate front face is neutralized by the suspension charge in air, this rate neutralized will change with configurations, area, etc. of an electrode which were formed on the piezo-electric substrate, and uneven density-of-electric-charge distribution will exist in some places on a piezo-electric substrate. In the narrow part of the gap of the electrode finger of a ctenidium-like electrode and electrode finger which constitute as a result, for example, an excitation electrode Very big electric field will be built, discharge takes place so that the above-mentioned density-of-electric-charge distribution may be eased, and the electrode finger of an excitation electrode deforms by this discharge, or a part fuses, and it exfoliates. For example, the filter shape deteriorated, and the piece of a metal which exfoliated adhered on electrodes, such as an excitation electrode, and had caused short [poor].
[0007] Then, while protecting an excitation electrode, it sets it as the purpose of this invention to offer the surface acoustic wave equipment which does not have property degradation like before and was very excellent in dependability.
[0008]
[Means for Solving the Problem] In order to make the above-mentioned purpose attain, the laminating of the excitation electrode which the surface acoustic wave equipment of this invention makes generate a surface acoustic wave on a piezo-electric substrate, and the protective layer to which resistivity/thickness changes from the ingredient which is 109-1013ohms is carried out one by one.
[0009] Moreover, if it is made for a protective layer to consist of an ingredient with the rate of a surface acoustic wave quicker than a piezo-electric substrate, it will become possible [designing the pitch of the electrode finger of an excitation electrode by bigger width of face as compared with the case where the conventional substrate layer is not prepared].
[0010] Moreover, when it considers as lithium tantalate as a piezo-electric substrate and considers as silicon as a protective layer especially, the thickness is good to be referred to as 75nm or less so that an insertion loss may become large and a filter shape may not deteriorate. In addition, a protective layer may be the composite material which made half-**********, resin, or glass made high resistance in addition to silicon contain electrical conducting materials, such as a carbon metallurgy group ingredient.
[0011]
[Embodiment of the Invention] Hereafter, the gestalt of operation concerning this invention is explained to a detail based on a drawing. The surface acoustic wave equipment of this invention prepares the excitation electrode 2 and reflector electrode 3 grade which consist of a metal on the piezo-electric substrate 1, as the part is shown in drawing 1 and drawing 3 , and covering formation of the protective layer 4 is carried out only to these electrode fields.

[0012] Moreover, two or more surface acoustic wave resonators 10 by which series connection was carried out as the equal circuit was shown in drawing 2 , The surface acoustic wave equipment S which consisted of two or more surface acoustic wave resonator 20 grades by which parallel connection was carried out, is surface acoustic wave filters, such as the so-called balance mold filter, and was constituted in this way A low pass filter is constituted as two or more surface acoustic wave resonators 10 by which series connection was carried out are also, a high-pass filter is constituted as the surface acoustic wave resonator 20 by which parallel connection was carried out is also, and a desired property is acquired.
[0013] Here, the piezo-electric substrate 1 consists of single crystals, such as lithium tantalate, lithium niobate, and a tetraboric acid lithium. Moreover, as an electrode material of excitation electrode 2 grade, the alloys (an aluminum-Si system, an aluminum-Cu system, aluminum-Ti system, etc.) which use aluminum and aluminum as a principal component can be used suitably. Moreover, a protective layer 4 can be used as semi-conductive ingredients, such as composite material which made insulating materials, such as silicon oxide (SiO2) and silicon nitride (Si2 N3), silicon, resin or glass, etc. contain electrical conducting materials, such as a carbon metallurgy group ingredient. After forming these excitation electrode 2 and a protective layer 4 with a CVD method, a spatter, a vacuum deposition method, etc., they remove a garbage by the lift-off method etc.
[0014] Moreover, when resistivity of a protective layer 4 is set to sigma and thickness is set to h, sigma/h shall be in within the limits which is 109-1013ohms. For this, sigma/h is 109. It is because relaxation of density-of-electric-charge distribution will not fully take place if it will be in the condition that the electrode short-circuited when smaller than omega and is larger than 1013 ohms.
[0015] According to this surface acoustic wave equipment S, by the pyroelectricity of the piezo-electric substrate 1, even if density-of-electric-charge distribution serves as an ununiformity between the electrode fingers of excitation electrode 2 grade, an excessive charge can flow through a protective layer 4, and the ununiformity of density-of-electric-charge distribution can be eased.
[0016] Here, when especially the piezo-electric substrate 1 is used as lithium tantalate and a surface acoustic wave filter is produced by using a protective layer 4 as silicon, the thickness of a protective layer 4 may be 75nm or less. This is because it became clear that an insertion loss became large suddenly and a filter shape deteriorated when it became thicker than 75nm.
[0017] Moreover, as compared with the case where a protective layer 4 is not formed for the pitch of an electrode finger in the design of excitation electrode 2 grade, formation with a bigger degree of freedom (width of face) is attained, and there is an advantage that production of the excitation electrode 2 is easily realizable because a protective layer 4 considers as an ingredient (it is silicon about lithium tantalate and a protective layer for example, in a piezo-electric substrate) with the rate of a surface acoustic wave quicker than the piezo-electric substrate 1 especially.
[0018] In addition, it is not limited to the surface acoustic wave filter of the above-mentioned gestalt, and that what is necessary is just the configuration that covering formation of the protective layer was carried out on the electrode field, surface acoustic wave equipment is not limited to the above-mentioned thing about the quality of the materials, such as an excitation electrode and a protective layer, but in the range which does not deviate from a summary, it can be changed suitably and can be carried out.
[0019]
[Example] Next, a concrete example is explained.
[0020] [Example] It is the same as that of the equal circuit which prepares the piezo-electric substrate of the lithium tantalate of X propagation by 36-degree rotation Y cut, and is first shown on this piezo-electric substrate at drawing 2 . From a lower layer so that it may become the aluminum film / silicone film, in order to make it the surface acoustic wave filter which demonstrates a desired filter shape The range of 200-500nm of thickness of the aluminum film, the thickness of 75nm or less of a silicone film, and electrode digit of 1 micrometer Extent and spacing of 1 micrometer of an electrode finger and an electrode finger Patterning formation was carried out with extent. This patterning formation is formation of the resist pattern by the photolithography. -> Formation of the aluminum film by vacuum deposition -> Removal of the unnecessary section by the lift-off method -> Formation of the resist pattern by the photolithography -> Formation of the silicone film by vacuum deposition -> Removal of the unnecessary section by the lift-off method performed.
[0021] It is because it became clear that a good filter shape was not shown when it is thicker than 75nm to have carried out covering formation at 75nm or less in thickness and the silicone film (resistivity 5 x105 omega-cm extent) was carried out here.
[0022] Thus, about the produced surface acoustic wave filter, the property with a good place that center frequency measured the filter shape by 900 MHz**200 MHz is shown. Discharge etc. was hardly produced (after supplying for about 30 minutes on the hot plate of about 150 **). When investigated about the incidence rate of a spark, when a silicone film is prepared only on the resonator which consists of an excitation electrode and a reflector electrode (however, the silicone film is put on the piezo-electric substrate between electrode lines), it is 3% or less of incidence rate, and a very good result was brought. Moreover, except for the electrode pad, when [of a piezo-electric substrate] it prepared in the whole surface mostly, it became about 12% of big incidence rate.
[0023]
[Effect of the Invention] According to the surface acoustic wave equipment of this invention, as explained above, even if density-of-electric-charge distribution is uneven inter-electrode [of an excitation electrode], a charge flows through the protective layer prepared on the excitation electrode, and the ununiformity of density-of-electric-charge distribution is eased. By this, even if it is the case that inter-electrode [of an excitation electrode] is very narrow, discharge by high electric field is prevented as much as possible, and the surface acoustic wave equipment which was excellent in the property can be offered with the sufficient yield.
[0024] Moreover, since the ingredient of high resistance is chosen as extent which does not spoil a filter shape, it receives short [inter-electrode / by the conductive foreign matter], and can protect.
[0025] Moreover, the dependability over high humidity can be raised by using especially a protective layer as hydrophobic ingredients, such as a silicone film.
[0026] Furthermore, since the rate of a surface acoustic wave is quicker than lithium tantalate, it becomes possible to excite a quicker surface acoustic wave, and silicon can produce the outstanding surface acoustic wave filter corresponding to a RF, even if it does not make the electrode finger pitch of an excitation electrode detailed.

[Translation done.]

* NOTICES *

1.This document has been translated by computer. So the translation may not reflect the original precisely.
2.**** shows the word which can not be translated.
3.In the drawings, any words are not translated.

DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]
[Drawing 1] The perspective view showing some surface acoustic wave equipments concerning this invention.
[Drawing 2] The circuit diagram explaining the equal circuit of an example of the surface acoustic wave equipment concerning this invention.
[Drawing 3] the A-A line in drawing 1 part -- a sectional view.
[Description of Notations]
1 ... Piezo-electric Substrate
2 ... Excitation Electrode
3 ... Reflector Electrode
4 ... Protective Layer
S ... Surface acoustic wave equipment

[Translation done.]

(19)日本国特許庁（ＪＰ）　(12) 公開特許公報（Ａ）　(11)特許出願公開番号

特開平10－163802

(43)公開日　平成10年(1998)６月19日

(51)Int.Cl.[6]		識別記号	ＦＩ		
Ｈ０３Ｈ	9/25		Ｈ０３Ｈ	9/25	Ａ
	9/145			9/145	Ｃ

審査請求　未請求　請求項の数２　ＯＬ　（全４頁）

(21)出願番号　特願平8－320521

(22)出願日　平成８年(1996)11月29日

(71)出願人　000006633
京セラ株式会社
京都府京都市山科区東野北井ノ上町５番地の22

(72)発明者　松田　敏哉
京都府相楽郡精華町光台３丁目５番地　京セラ株式会社中央研究所内

(72)発明者　加賀井　恵美
京都府相楽郡精華町光台３丁目５番地　京セラ株式会社中央研究所内

(72)発明者　船見　雅之
京都府相楽郡精華町光台３丁目５番地　京セラ株式会社中央研究所内

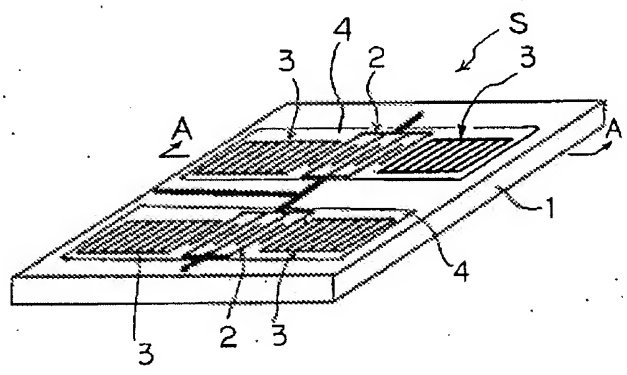
最終頁に続く

(54)【発明の名称】　弾性表面波装置

(57)【要約】

【課題】　励振電極の保護を行うとともに、従来のような特性劣化がなく信頼性の非常に優れた弾性表面波装置を提供すること。

【解決手段】　圧電基板１上に、弾性表面波を発生させる励振電極３、及び保護層４を順次積層して成る弾性表面波装置であって、保護層４は、比抵抗値σ、膜厚をｈとしたときに、σ／ｈが10^{9}～10^{13}Ωの範囲であることを特徴とする。



1

【特許請求の範囲】

【請求項１】　圧電基板上に、弾性表面波を発生させる励振電極を形成するとともに、該励振電極上に、比抵抗値と膜厚との比（比抵抗値／膜厚）が10^{9}～10^{13} Ωの材料から成る保護層を被着させた弾性表面波装置。

【請求項２】　前記保護層は前記圧電基板より弾性表面波の速度が速い材料から成ることを特徴とする請求項１に記載の弾性表面波装置。

【発明の詳細な説明】

【０００１】

【発明の属する技術分野】本発明は、タンタル酸リチウム、ニオブ酸リチウム、四ほう酸リチウム等の単結晶から成る圧電基板に、励振電極を設けて成る弾性表面波（ＳＡＷ）フィルタ等の弾性表面波装置に関する。

【０００２】

【従来の技術とその課題】従来より、タンタル酸リチウム（$LiTaO_3$）等の単結晶は、一般に圧電材料の性能評価として用いられる電気機械結合係数が大きい材料として大変注目されており、例えば、弾性表面波フィルタや弾性表面波共振器等の弾性表面波装置、バルク波デバイス等の各種圧電デバイスに用いられる材料として有望視されている。

【０００３】特に、３６°ＹカットＸ伝搬のタンタル酸リチウム単結晶を基板として用い、アルミニウムをＩＤＴ電極材料として用いた場合、伝搬させる弾性表面波の波長に対するＩＤＴ電極の規格化膜厚Ｈ／λを０．１以下にすることが最適であるとされている（例えば、特開平６－１８６７３号公報等を参照）。

【０００４】しかしながら、例えばセルラー電話、ＰＨＳ（Personal Handy-phone System）等の移動体通信用電話に使用されるフロントエンドＳＡＷフィルタ（アナログ：９００MHz 帯，デジタル：１５GHz 帯）を構成するには、例えばＡＭＰＳ（Advanced Mobile Phone Service)方式であれば、２０ｄＢ以上の大きな帯域外減衰量が最低でも必要とされるにもかかわらず、特性的に優れたタンタル酸リチウム単結晶を基板材料に適用しようとしても、上述のような帯域外減衰量を備え、しかも挿入損失が小さいものはなかった。また、完成品の特性のばらつきが大きかったり、特性不良のものが多く発生していた。

【０００５】このような原因の一つとして以下に示すことが考えられる。例えば、弾性表面波フィルタは、上記のような圧電基板の上に、櫛歯状を成す励振電極等の金属電極が設けられ、この励振電極等の金属電極上に絶縁性材料から成る保護膜が被覆されて構成されているのが一般的であるが、励振電極等の電極形成後の工程などで圧電基板が高温の環境下に置かれると、圧電基板表面に不均一な電荷分布が生じて、これが原因となって発生した放電で電極が変形等したりして、ひいてはフィルタ特性の劣化等を誘発していたのである。

2

【０００６】すなわち、励振電極等の電極形成後のパッケージ実装時におけるダイボンディングやワイヤーボンディング等の工程において、圧電基板が約８０℃以上の高温下に置かれると、圧電基板の焦電性により圧電基板表面に電荷分布が生ずる。そして、この圧電基板表面に生じた電荷は、空気中の浮遊電荷により中和されていくが、この中和されていく速度は、圧電基板上に形成された電極の形状や面積等により異なり、所々に不均一な電荷密度分布が圧電基板上に存在することになる。その結果、例えば励振電極を構成する櫛歯状電極の電極指と電極指との間隙の狭い部分において、非常に大きな電界がかかることになり、上記電荷密度分布を緩和するように放電が起こり、この放電により励振電極の電極指が変形したり、一部が溶融して剥離するなどして、例えばフィルタ特性が劣化したり、剥離した金属片が励振電極等の電極上に付着してショート不良を招いていたのである。

【０００７】そこで、励振電極の保護を行うとともに、従来のような特性劣化がなく信頼性の非常に優れた弾性表面波装置を提供することを本発明の目的とする。

【０００８】

【課題を解決するための手段】上記目的を達成させるために、本発明の弾性表面波装置は、圧電基板上に、弾性表面波を発生させる励振電極、及び、比抵抗値／膜厚が10^{9}～10^{13} Ωの材料から成る保護層が順次積層されている。

【０００９】また、保護層は圧電基板より弾性表面波の速度が速い材料から成るようにすれば、励振電極の電極指のピッチを従来の下地層を設けない場合に比して、より大きな幅で設計することが可能となる。

【００１０】また特に、圧電基板としてタンタル酸リチウム、保護層としてシリコンとした場合、その厚さは挿入損失が大きくなりフィルタ特性が劣化しないように７５ｎｍ以下とするとよい。なお、保護層はシリコン以外に高抵抗にさせた半導導電性膜、樹脂又はガラス等に炭素や金属材料などの導電材料を含有させた複合材料等であってもよい。

【００１１】

【発明の実施の形態】以下、本発明に係る実施の形態について図面に基づき詳細に説明する。本発明の弾性表面波装置は、例えば図１及び図３にその一部分を示すように、圧電基板１上に金属から成る励振電極２及び反射器電極３等を設けたものでありこれらの電極領域にのみ保護層４が被着形成されている。

【００１２】また、その等価回路は図２に示すように、直列接続された複数の弾性表面波共振子１０と、並列接続された複数の弾性表面波共振子２０等から構成され、いわゆるバランス型フィルタなどの弾性表面波フィルタになっており、このように構成された弾性表面波装置Ｓは、複数の直列接続された弾性表面波共振子１０でもってローパスフィルタを構成し、並列接続された弾性表面

波共振子２０でもってハイパスフィルタを構成して所望の特性を得るものである。

【００１３】ここで、圧電基板１はタンタル酸リチウム、ニオブ酸リチウム、四ほう酸リチウム等の単結晶から成るものである。また、励振電極２等の電極材料としては、アルミニウムやアルミニウムを主成分とする合金（Ａｌ－Ｓｉ系，Ａｌ－Ｃｕ系，Ａｌ－Ｔｉ系等）を好適に用いることができる。また、保護層４は酸化シリコン（SiO_2）、窒化シリコン（Si_2N_3）などの絶縁材料やシリコン、樹脂又はガラス等に炭素や金属材料などの導電材料を含有させた複合材料等の半導電性材料とすることができる。これら励振電極２及び保護層４はＣＶＤ法、スパッタ法、真空蒸着法などにより形成した後、リフトオフ法などにより不要部分を除去する。

【００１４】また、保護層４の比抵抗値をσ、膜厚をｈとした場合に、σ／ｈが10^9～10^{13}Ωの範囲内にあるものとする。これは、σ／ｈが10^9Ωより小さいと、電極がショートした状態となり、10^{13}Ωより大きいと電荷密度分布の緩和が充分に起こらないからである。

【００１５】この弾性表面波装置Ｓによれば、圧電基板１の焦電性により、励振電極２等の電極指間で電荷密度分布が不均一となっても保護層４を通じて余分な電荷が流れ、電荷密度分布の不均一を緩和することができる。

【００１６】ここで、特に圧電基板１をタンタル酸リチウムとし、保護層４をシリコンとして弾性表面波フィルタを作製した場合には、保護層４の膜厚は７５ｎｍ以下とする。これは、７５ｎｍより厚くなると挿入損失が急に大きくなりフィルタ特性が劣化することが判明したからである。

【００１７】また特に、保護層４が圧電基板１より弾性表面波の速度が速い材料（例えば、圧電基板をタンタル酸リチウム、保護層をシリコン）とすることで、励振電極２等の設計において、電極指のピッチを保護層４を設けない場合と比較して、より大きな自由度（幅）での形成が可能となり、励振電極２の作製を容易に実現できるという利点がある。

【００１８】なお、弾性表面波装置は上記形態の弾性表面波フィルタに限定されるものではなく、電極領域上に保護層が被着形成された構成であればよく、励振電極、及び保護層等の材質についても上記のものに限定されず、要旨を逸脱しない範囲で適宜変更し実施が可能である。

【００１９】

【実施例】次に、具体的な実施例について説明する。

【００２０】〔実施例〕まず、３６°回転ＹカットでＸ伝搬のタンタル酸リチウムの圧電基板を用意し、この圧電基板上に、図２に示す等価回路と同様で、所望のフィルタ特性を発揮させる弾性表面波フィルタにするべく、下の層から、アルミニウム膜／シリコン膜となるように、アルミニウム膜の膜厚２００～５００ｎｍの範囲、シリコン膜の膜厚７５ｎｍ以下、電極指幅１μｍ程度、電極指と電極指との間隔１μｍ程度でパターニング形成した。このパターニング形成は、フォトリソグラフィによるレジストパターンの形成　→　蒸着法によるアルミニウム膜の形成　→　リフトオフ法による不要部の除去　→　フォトリソグラフィによるレジストパターンの形成　→　蒸着法によるシリコン膜の形成　→　リフトオフ法による不要部の除去により行った。

【００２１】ここで、シリコン膜（比抵抗値5×10^5Ω・cm程度）を厚さ７５ｎｍ以下に被着形成したのは、７５ｎｍより厚くすると良好なフィルタ特性を示さないことが判明したからである。

【００２２】このようにして作製した弾性表面波フィルタについて、中心周波数が900 ＭＨｚ±200 ＭＨｚでフィルタ特性の測定を行ったところ良好な特性を示し、放電等はほとんど生じなかった（約150 ℃のホットプレート上に約３０分間投入した後に、スパークの発生率について調べたところ、シリコン膜を励振電極及び反射器電極からなる共振子上にのみ（ただし、電極線間の圧電基板上にはシリコン膜が被着されている）設けた場合３％以下の発生率であり、きわめて良好な結果となった。また、電極パッドを除いて圧電基板のほぼ全面に設けた場合は約１２％の大きな発生率となった。

【００２３】

【発明の効果】以上説明したように、本発明の弾性表面波装置によれば、励振電極の電極間で電荷密度分布が不均一であっても、励振電極上に設けた保護層を通じて電荷が流れ、電荷密度分布の不均一を緩和する。これにより、励振電極の電極間が非常に狭い場合であっても高電界による放電が極力防止され、特性の優れた弾性表面波装置を歩留り良く提供することができる。

【００２４】また、フィルタ特性を損なわない程度に高い抵抗の材料を選択するので、導電性異物による電極間のショートに対して保護することができる。

【００２５】また、特に保護層をシリコン膜等の疎水性の材料とすることにより、高湿度に対する信頼性を向上させることができる。

【００２６】さらに、シリコンはタンタル酸リチウムより弾性表面波の速度が速いので、より速い弾性表面波を励起することが可能になり、励振電極の電極指ピッチを微細にしなくとも高周波に対応した優れた弾性表面波フィルタを作製することができる。

【図面の簡単な説明】

【図１】本発明に係る弾性表面波装置の一部分を示す斜視図。

【図２】本発明に係る弾性表面波装置の一例の等価回路を説明する回路図。

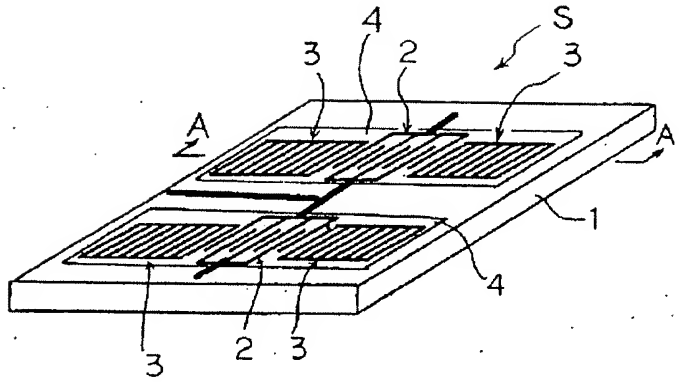
【図３】図１におけるＡ－Ａ線一部断面図。

【符号の説明】

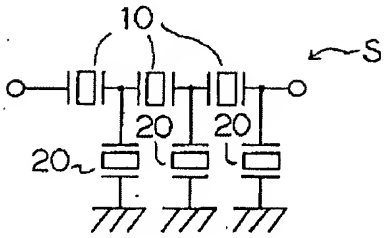
5　　6

1　・・・　圧電基板
2　・・・　励振電極
3　・・・　反射器電極
＊4　・・・　保護層
S　・・・　弾性表面波装置

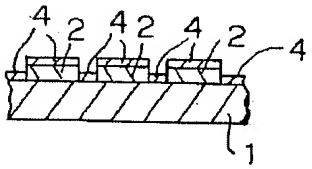
【図１】



【図２】



【図３】



フロントページの続き

(72)発明者　池上　佳秀
京都府相楽郡精華町光台３丁目５番地　京セラ株式会社中央研究所内